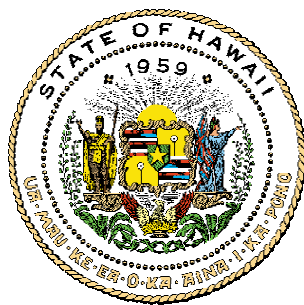


Population and Economic Projections for the State of Hawaii to 2030

DBEDT 2030 Series

Report Results and Methodology



Research and Economic Analysis Division
Department of Business, Economic Development and Tourism

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1. Summary of Projections

This report presents the results and methodology of the 2030 Series of the DBEDT's Population and Economic Projections for the State of Hawaii and its four counties. This is the sixth in a series of long-range projections dating back to the first report published in 1978.

The impetus for this edition of the projections was the availability of new benchmarks in the form of county population by single-year age and sex tables from the 2000 Population Census and updated input-output (I-O) tables based on the 1997 Economic Census. This edition is notable for the introduction of a revised projection methodology based on an inter-county I-O table of the Hawaii economy.

It should be noted that, consistent with previous DBEDT's long-range forecasts, these projections are neither targets nor goals. They are DBEDT's best estimate of likely trends in important population and economic indicators based on currently available information and are intended primarily for use as baselines for long-term infrastructure planning. Whether these projections prove to be close to the values observed in the future depends on the degree to which historical trends provide a guide to the future and the influence of unforeseen external factors.

Section 1 of this report summarizes the population and economic projections for the state and counties. Section 2 describes the methodology and assumptions that were used to produce the projections. The appendix contains tables of detailed projections and the critical parameters used in the estimation.

Population

The resident population of Hawaii, shown in Table 1-1, which includes active-duty military personnel and their dependents but excludes visitors, is projected to increase from 1.21 million persons in mid-2000 to 1.63 million in mid- 2030, an average rate of growth of slightly less than 1.0 percent per year over the 30 year period.

Military-related resident population is held constant at 85,850, the July 1, 2000 level through the period of projection. The forecast for non-military-related (other civilian) resident population is up from 1.13 million to 1.54 million during the same period, or an increase of slightly more than 1.0 percent per year.

The de facto population, which includes visitors present, but excludes residents temporarily absent, is projected to grow from 1.34 million persons in 2000 to 1.83 million in 2030. The rate of growth of the de facto population is just over 1.0 percent per year, about 80 percent of which is accounted for by resident population growth.

Table 1-1. Resident and De Facto Population by Status, 1980-2030 (as of July 1)

Year	Resident population ¹		De facto population ²		
	Total	Other civilian	Total	Visitors present	Residents absent
1980	968,500	846,500	1,054,218	96,406	10,688
1985	1,039,698	919,034	1,136,160	116,107	19,645
1990	1,113,491	997,589	1,240,013	154,516	27,994
1995	1,196,854	1,099,814	1,298,096	157,098	55,856
2000	1,212,670	1,126,821	1,335,156	168,637	46,151
2005	1,277,950	1,192,100	1,406,650	177,223	48,523
2010	1,346,600	1,260,750	1,490,500	194,979	51,079
2015	1,418,650	1,332,800	1,579,400	214,511	53,761
2020	1,489,550	1,403,700	1,663,450	230,269	56,319
2025	1,560,400	1,474,550	1,748,600	247,182	58,982
2030	1,630,450	1,544,600	1,834,200	265,333	61,583

Average annual growth rate (%)

1980-1985	1.4	1.7	1.5	3.8	12.9
1985-1990	1.4	1.7	1.8	5.9	7.3
1990-1995	1.5	2.0	0.9	0.3	14.8
1995-2000	0.3	0.5	0.6	1.4	-3.7
2000-2005	1.1	1.1	1.0	1.0	1.0
2005-2010	1.1	1.1	1.2	1.9	1.0
2010-2015	1.0	1.1	1.2	1.9	1.0
2015-2020	1.0	1.0	1.0	1.4	0.9
2020-2025	0.9	1.0	1.0	1.4	0.9
2025-2030	0.9	0.9	1.0	1.4	0.9

1. The resident population is defined as the number of persons whose usual place of residence is in an area, regardless of physical location on the census or estimate date. It includes armed forces stationed or home-ported in an area but excludes persons of local origin attending school or in military service outside the area.

2. The de facto population is defined as the number of persons physically present in an area, regardless of usual place of residence. It includes visitors present but excludes residents temporarily absent. The resident population is based on July 1 estimates. Visitors present and residents absent are based on calendar year averages.

Table 1-2. Resident Population by County, 1980-2030

Year	State Total	Hawaii County	Honolulu County	Kauai County	Maui County
1980	968,500	92,900	764,600	39,400	71,600
1985	1,039,698	105,900	804,294	44,357	85,147
1990	1,113,491	121,572	838,534	51,676	101,709
1995	1,196,854	140,492	881,399	57,068	117,895
2000	1,212,670	149,261	875,881	58,560	128,968
2005	1,277,950	163,000	912,900	62,000	140,050
2010	1,346,600	176,750	952,650	65,900	151,300
2015	1,418,650	190,300	995,550	70,200	162,600
2020	1,489,500	203,050	1,037,250	74,750	174,450
2025	1,560,400	216,150	1,078,050	79,350	186,850
2030	1,630,450	229,700	1,117,300	83,900	199,550

Average annual growth rate (%)					
1980-1985	1.4	2.7	1.0	2.4	3.5
1985-1990	1.4	2.8	0.8	3.1	3.6
1990-1995	1.5	2.9	1.0	2.0	3.0
1995-2000	0.3	1.2	-0.1	0.5	1.8
2000-2005	1.1	1.8	0.8	1.1	1.7
2005-2010	1.1	1.6	0.9	1.2	1.6
2010-2015	1.0	1.5	0.9	1.3	1.5
2015-2020	1.0	1.3	0.8	1.3	1.4
2020-2025	0.9	1.3	0.8	1.2	1.4
2025-2030	0.9	1.2	0.7	1.1	1.3

Tables 1-2 and 1-3 present the projections of resident and de facto population by county, respectively. As has been the case in previous DBEDT's long-range projections, the Neighbor Islands are projected to grow more rapidly than Honolulu. The resident population of the City and County of Honolulu is projected to increase at an annual rate of about 0.8 percent from 2000 to 2030, while Hawaii County is projected to grow at about 1.4 percent annually, Maui County at 1.5 percent and Kauai at 1.2 percent.

Of the projected 418,000 person growth in population in Hawaii from 2000 to 2030, about 240,000 is projected for Honolulu and about 176,000 for the Neighbor Islands. If growth were to occur at these levels, the share of the Neighbor Islands in Hawaii's resident population would grow from 27.8 percent in 2000 to 31.5 percent 2030.

Table 1-3. De Facto Population by County, 1980-2030

Year	State Total	Hawaii County	Honolulu County	Kauai County	Maui County
1980	1,054,218	99,181	822,408	46,341	86,288
1985	1,136,160	112,343	853,605	55,086	115,125
1990	1,257,319	137,103	913,268	68,558	138,390
1995	1,298,096	152,482	921,626	68,844	155,144
2000	1,335,156	166,446	925,444	74,726	168,540
2005	1,406,650	180,800	964,950	79,050	181,850
2010	1,490,500	196,500	1,011,600	84,850	197,550
2015	1,579,400	212,250	1,062,100	91,200	213,850
2020	1,663,450	226,800	1,109,500	97,450	229,700
2025	1,748,600	241,800	1,156,550	103,850	246,400
2030	1,834,200	257,700	1,202,600	110,400	263,500

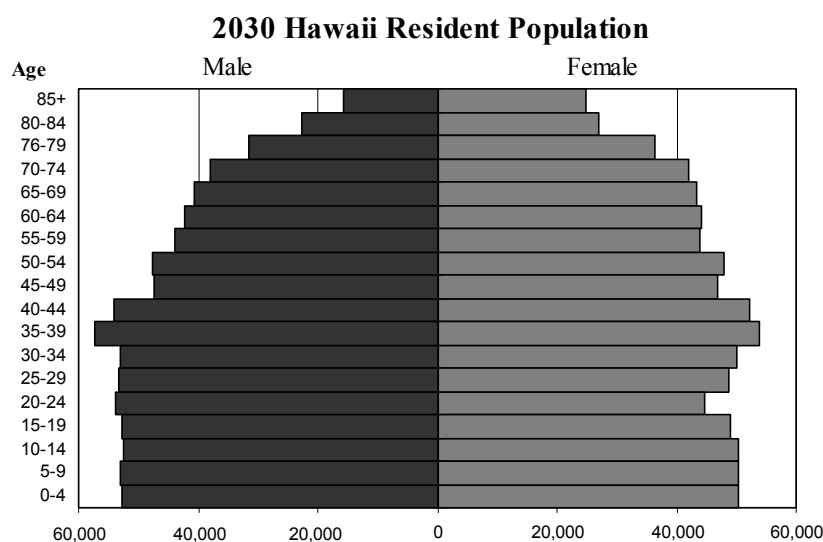
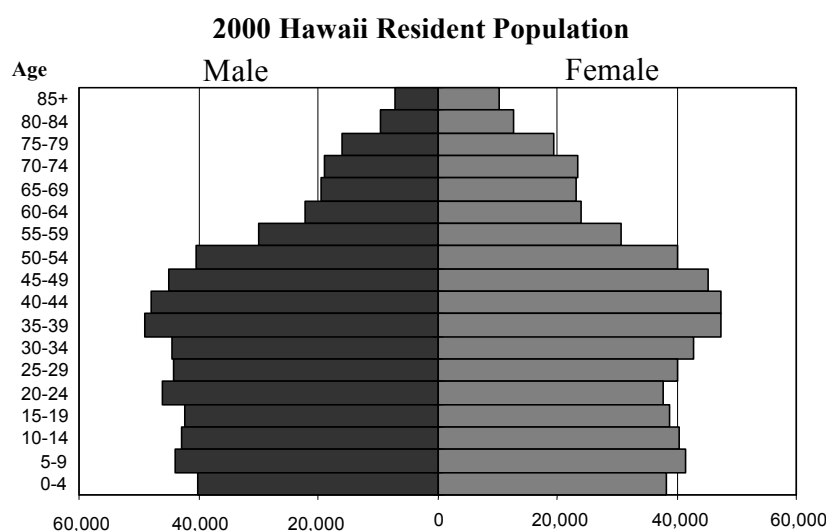
Average annual growth rate (%)					
1980-1985	1.5	2.5	0.7	3.5	5.9
1985-1990	2.0	4.1	1.4	4.5	3.7
1990-1995	0.6	2.1	0.2	0.1	2.3
1995-2000	0.6	1.8	0.1	1.7	1.7
2000-2005	1.0	1.7	0.8	1.1	1.5
2005-2010	1.2	1.7	0.9	1.4	1.7
2010-2015	1.2	1.6	1.0	1.5	1.6
2015-2020	1.0	1.3	0.9	1.3	1.4
2020-2025	1.0	1.3	0.8	1.3	1.4
2025-2030	1.0	1.3	0.8	1.2	1.4

Table 1-4. Components of Change in the Civilian Population, 1980-2030 (annual average for the period)

Period	Population change	Number of births	Number of deaths	Net migration
1980-1985	14,650	14,700	5,200	5,150
1985-1990	15,700	15,000	6,050	6,800
1990-1995	20,450	15,950	7,000	11,450
1995-2000	5,450	14,700	7,950	-1,300
2000-2005	12,700	14,800	9,350	7,250
2005-2010	13,600	15,550	10,500	8,550
2010-2015	14,250	16,300	11,550	9,500
2015-2020	14,050	16,950	12,450	9,550
2020-2025	14,050	17,650	13,350	9,750
2025-2030	13,750	18,400	14,600	9,950

Table 1-4 shows the composition of the change in other civilian population over the last two decades and for the projection period. Whereas, natural population growth -- the surplus of births over deaths -- was previously the more important contributor to total population growth, it is now forecast that in-migration will provide the larger share of population growth. While both births and deaths are forecast to increase during the projection period, average annual deaths are expected to increase at a higher rate. This trend is directly linked to the aging of Hawaii's population.

Figure 1.1. Projected Age Distribution: Hawaii Resident Population, 2000 and 2030



In 2000, the share of Hawaii's other civilian population aged 65 and over was 14.2 percent. In 2030, this share is projected to be 21.0 percent. The changing age composition of the Hawaii population is shown in Figure 1-1.

Appendix Tables A-1 through A-22 in the Appendix provide more detailed population projections and historical resident and de facto population series.

Gross State Product

Summary economic and demographic projections are presented in Table 1-5. Hawaii's gross state product (GSP) and personal income are projected to grow at higher rates than population and labor force. In the case of GSP, the growth rate is related to the growth in productive resources (labor force and capital) and the increasing productivity of the resources. Personal income growth is also related to resource and productivity growth augmented by transfer payments, which consist largely of retirement, medical, and unemployment payments. GSP and personal income for the City and County of Honolulu are projected to grow more slowly than for the Neighbor Islands, because of the lower rates of resource growth and slower growth in visitor expenditure.

Hawaii real gross state product is forecast to grow at about 2.2 percent per year throughout the forecast period. Figure 1-2 shows the historical and projected growth of Hawaii GSP. The rate of GSP growth is dependent on earnings from outside the region (from tourism, federal spending, and exports of goods and services), investment, and consumption and state and local government spending from local incomes. The projected growth rates of real and nominal gross county product by county are presented in Appendix Table A-23.

Personal Income

Historical and projected growth rates of real personal income for the five-year periods from 1970 to 2030 are presented in Figure 1-3. The annual growth rate of Hawaii personal income in real terms (in 2000 dollars) is forecasted to be 2.9 percent in the 2000-2005 period, declining to 2.5 percent and less in the later years. Not surprisingly, given the change aging of Hawaii's population, the contribution of transfer payments to personal income is forecasted to increase in all counties over the projection period.

The projected values and growth rates of the major components of personal income by county are presented in Appendix Tables A-25 and A-26. Detailed historical series of personal income are reported in Appendix Tables A-27 through A-31.

Table 1-5. Projection of Selected State and County Variables, 2000-2030

	2000	2005	2010	2015	2020	2025	2030
State							
Gross state product (mil. 2000\$)	42,524	47,168	52,499	58,808	65,657	73,314	81,549
Personal income (mil. 2000\$)	34,384	39,631	44,862	50,941	57,715	65,204	73,150
Resident population	1,212,670	1,277,950	1,346,600	1,418,650	1,489,500	1,560,400	1,630,450
Total civilian employment	566,100	593,400	621,450	647,350	672,900	698,950	725,850
Labor force	591,350	621,500	651,900	679,150	705,950	733,350	761,550
Unemployment rate (%)	4.3	4.5	4.7	4.7	4.7	4.7	4.7
Wage and salary jobs	559,350	588,846	617,193	645,168	672,801	701,304	730,632
Hawaii County							
Gross county product (mil. 2000\$)	3,918	4,344	4,856	5,496	6,226	7,045	7,939
Personal income (mil. 2000\$)	3,133	3,787	4,401	5,165	6,072	7,044	8,023
Resident population	149,261	163,000	176,750	190,300	203,050	216,150	229,700
Total civilian employment	65,000	70,650	74,850	78,950	83,050	87,300	91,750
Labor force	69,600	75,550	80,050	84,450	88,800	93,350	98,100
Unemployment rate (%)	6.6	6.5	6.5	6.5	6.5	6.5	6.5
Wage and salary jobs	55,900	60,733	64,607	68,608	72,619	76,825	81,258
Honolulu County							
Gross county product (mil. 2000\$)	32,009	35,560	39,502	44,135	49,150	54,751	60,742
Personal income (mil. 2000\$)	26,644	30,429	34,241	38,578	43,303	48,547	54,191
Resident population	875,881	912,900	952,650	995,550	1,037,250	1,078,050	1,117,300
Total civilian employment	405,450	420,300	438,700	455,200	471,350	487,650	504,300
Labor force	421,200	438,250	457,900	475,200	492,000	509,050	526,400
Unemployment rate (%)	3.7	4.1	4.2	4.2	4.2	4.2	4.2
Wage and salary jobs	414,550	432,988	451,981	470,350	488,328	506,721	525,425
Kauai County							
Gross county product (mil. 2000\$)	1,874	2,061	2,314	2,619	2,942	3,299	3,690
Personal income (mil. 2000\$)	1,387	1,594	1,832	2,127	2,472	2,844	3,232
Resident population	58,560	62,000	65,900	70,200	74,750	79,350	83,900
Total civilian employment	27,250	28,900	30,300	31,750	33,250	34,800	36,400
Labor force	29,150	30,550	32,200	33,800	35,350	37,000	38,750
Unemployment rate (%)	6.5	5.5	6.0	6.0	6.0	6.0	6.0
Wage and salary jobs	26,450	28,401	30,126	31,912	33,690	35,558	37,511
Maui County							
Gross county product (mil. 2000\$)	4,723	5,204	5,826	6,558	7,339	8,219	9,177
Personal income (mil. 2000\$)	3,220	3,820	4,389	5,071	5,868	6,768	7,704
Resident population	128,969	140,050	151,300	162,600	174,450	186,850	199,550
Total civilian employment	68,400	73,550	77,600	81,450	85,300	89,250	93,400
Labor force	71,400	77,100	81,700	85,700	89,750	93,950	98,300
Unemployment rate (%)	4.2	4.6	5.0	5.0	5.0	5.0	5.0
Wage and salary jobs	62,450	66,722	70,479	74,297	78,163	82,201	86,438

Table 1-5. Projection of Selected State and County Variables, 2000-2030 – Contd (average annual percentage growth rate)

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
State						
Gross state product (mil. 2000\$)	2.1	2.2	2.3	2.2	2.2	2.2
Personal income (mil. 2000\$)	2.9	2.5	2.6	2.5	2.5	2.3
Resident population	1.1	1.1	1.0	1.0	0.9	0.9
Total civilian employment	0.9	0.9	0.8	0.8	0.8	0.8
Labor force	1.0	1.0	0.8	0.8	0.8	0.8
Total wage and salary jobs	1.0	0.9	0.9	0.8	0.8	0.8
Hawaii County						
Gross county product (mil. 2000\$)	2.1	2.3	2.5	2.5	2.5	2.4
Personal income (mil. 2000\$)	3.9	3.1	3.3	3.3	3.0	2.6
Resident population	1.8	1.6	1.5	1.3	1.3	1.2
Total civilian employment	1.7	1.2	1.1	1.0	1.0	1.0
Labor force	1.7	1.2	1.1	1.0	1.0	1.0
Total wage and salary jobs	1.7	1.2	1.2	1.1	1.1	1.1
Honolulu County						
Gross county product (mil. 2000\$)	2.1	2.1	2.2	2.2	2.2	2.1
Personal income (mil. 2000\$)	2.7	2.4	2.4	2.3	2.3	2.2
Resident population	0.8	0.9	0.9	0.8	0.8	0.7
Total civilian employment	0.7	0.9	0.7	0.7	0.7	0.7
Labor force	0.8	0.9	0.7	0.7	0.7	0.7
Total wage and salary jobs	0.9	0.9	0.8	0.8	0.7	0.7
Kauai County						
Gross county product (mil. 2000\$)	1.9	2.3	2.5	2.4	2.3	2.3
Personal income (mil. 2000\$)	2.8	2.8	3.0	3.0	2.8	2.6
Resident population	1.1	1.2	1.3	1.3	1.2	1.1
Total civilian employment	1.2	1.0	0.9	0.9	0.9	0.9
Labor force	0.9	1.1	1.0	0.9	0.9	0.9
Total wage and salary jobs	1.4	1.2	1.2	1.1	1.1	1.1
Maui County						
Gross county product (mil. 2000\$)	2.0	2.3	2.4	2.3	2.3	2.2
Personal income (mil. 2000\$)	3.5	2.8	2.9	3.0	2.9	2.6
Resident population	1.7	1.6	1.5	1.4	1.4	1.3
Total civilian employment	1.5	1.1	1.0	0.9	0.9	0.9
Labor force	1.5	1.2	1.0	0.9	0.9	0.9
Total wage and salary jobs	1.3	1.1	1.1	1.0	1.0	1.0

Figure 1-2. Actual and Projected Hawaii Real Gross State Product, 1980-2030 (Percent Annual Growth Rate)

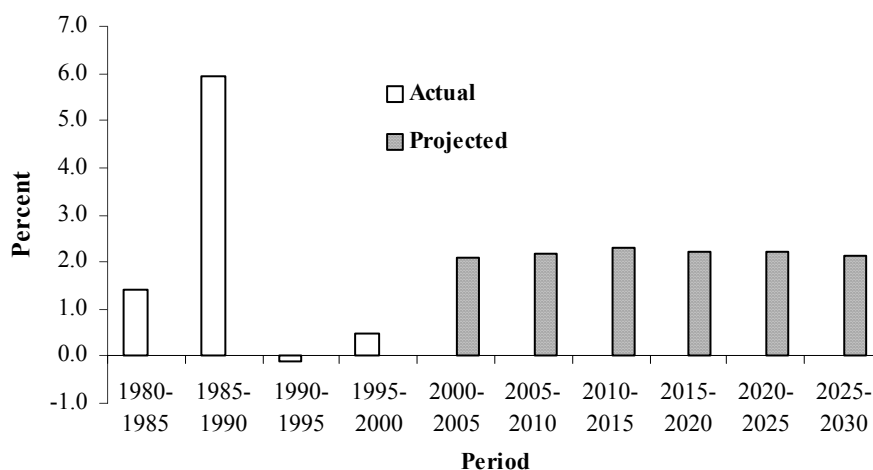
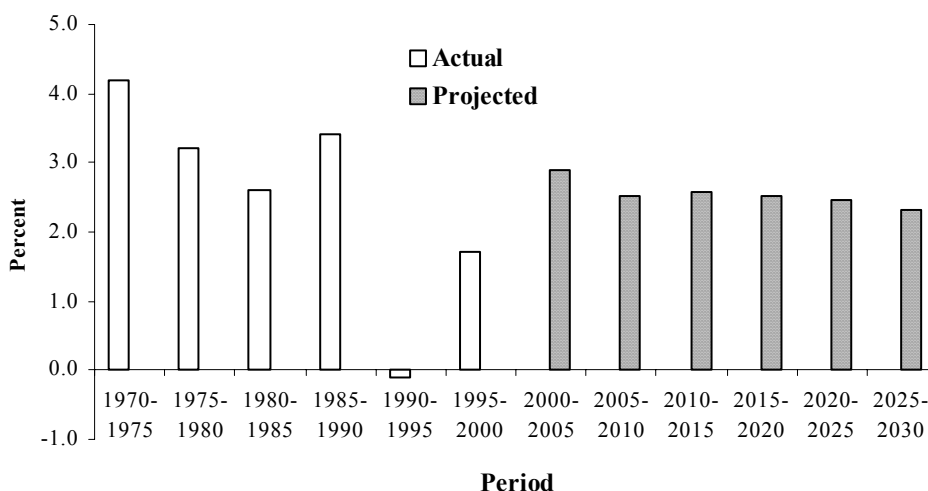


Figure 1-3. Actual and Projected Real Hawaii Personal Income, 1970 to 2030 (Percent Annual Growth Rate)



Employment

Total civilian employment in Hawaii is expected to increase from 566,100 in 2000 to 725,850 in 2030, an annual growth rate of 0.8 percent.¹ During this period, the resident population between 18 and 64, is projected to increase from 756,150 to 935,450, a 0.7 percent

¹ Since these projections were produced, the Hawaii Department of Labor and Industrial Relations has re-benchmarked the estimates of civilian employment in Hawaii for the years 1997 through 2002. The effect of re-benchmarking has been to increase most estimates. For example, the 2000 annual average civilian employment estimate for the state is now 578,200 rather than 566,100, and increase of 2.1 percent.

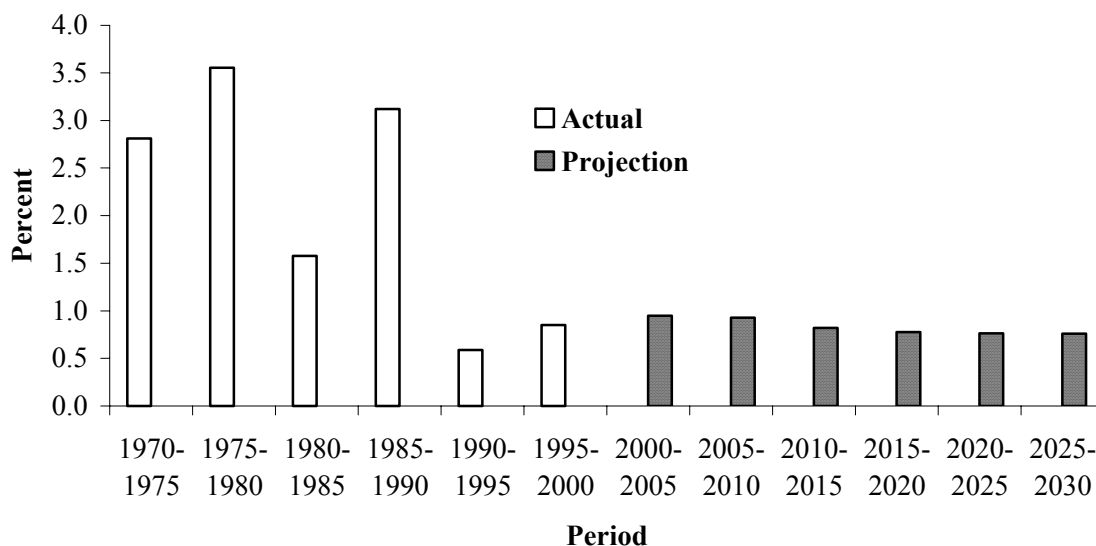
annual increase. This variance implies an increase in the share of the 18 to 64 population group who are employed in the civilian workforce from 74.9 percent to 77.8 percent. However, some of the difference could also come from increased employment by people younger than 18 or older than 64. The general increase in labor force participation rate reflects the long-term national trend arising from the continuing increase in the share of women in the labor force.

The civilian employed share of the 18 to 64 population varies notably by county. During the 1990s, Honolulu had the lowest employed share that averaged 75.1 percent and ranged from 73.9 to 76.9 percent. Hawaii County also had a low share of its 18 to 64 population employed at 75.6 percent. Maui and Kauai have higher average employed shares at 87.7 and 78.9 percent, respectively. More detailed data on projected employment are presented in the Appendix Table A-51 and historical employment and labor force data are presented in Tables A-62 through A-66.

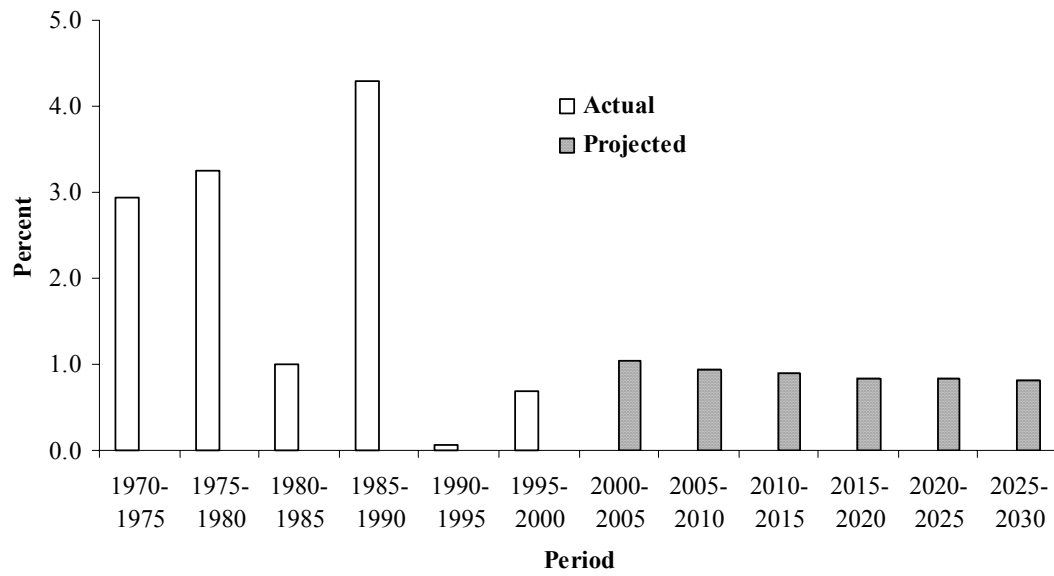
Civilian Wage and Salary Jobs

Total civilian wage and salary jobs for the state are projected to increase from 559,350 in 2000 to about 730,650 in 2030, an average annual growth rate of 0.9 percent. Wage and salary jobs in other counties are expected to increase at a faster rate than in Honolulu. Historical and projected growth rates of total civilian wage and salary jobs for the state for the five-year periods from 1970 to 2030 are presented in Figure 1-5. More detailed data on wage and salary jobs projections are presented in Appendix Tables A-52 to A-56 and historical wage and salary jobs series are presented in Appendix Tables A-62 through A-66.

Figure 1-4. Actual and Projected Hawaii Total Civilian Employment, 1970-2030 (Percent Annual Growth Rates)



**Figure 1-5. Actual and Projected Hawaii Total Civilian Wage and Salary Jobs, 1970-2030
(Percent Annual Growth Rates)**



2. Hawaii Population and Economic Projection Methodology

The DBEDT's 2030 projection series marks a departure from previous Hawaii long-range forecasts in that the central element of the economic projection is an inter-county input-output (I-O) model. This recently developed inter-county model replaces the sets of recursive equations that formed the core of previous versions of the economic projections. The decisions to produce an inter-county I-O model for Hawaii and base the projection on it stemmed from the desire to improve the county allocation procedure used in earlier projection series.

Adoption of the new I-O framework as the basis for economic projection has both benefits and drawbacks. On the positive side, the inter-county I-O model permits the final demand component forecasts and the interindustry characteristics of each county to be specified individually. But abandoning the statewide format precludes the possibility of using regression-based equations to estimate final demands and other economic variables due to the unavailability of historical county level final demand component data series. However, the general approach and the objectives of the process remain the same. A consistent set of economic and demographic projections are developed based on observed trends of relevant variables for individual counties and also based on projections of U.S. growth, among other variables, from UCLA Anderson Forecasts, Blue Chip Consensus Forecasts, and the U.S. Census Bureau.

It must be noted at the outset that, despite comprehensive data analysis and the precision of the model calculations, there is no unique solution to the projection of Hawaii's future population and economy. Estimates of factors, such as fertility, mortality, migration, final demand growth, price change, labor productivity, and labor force participation are necessarily uncertain. Every effort has been made to produce estimates of the relevant variables that are in keeping with observation of Hawaii's past and that are consistent and coordinated with each other. In the end, however, the effects of many hundreds of analytical judgments determine the resulting projections.

The projections are found in the attached appendices. Statewide population growth is projected to be about 1.0 percent annually until 2020 after which the growth rate tapers off slightly. This rate of growth is higher than 0.85 percent rate projected for the nation as a whole by the U.S. Census Bureau,² but is lower than the 1.47 percent that the Census Bureau projected for the State of Hawaii.³

The following sections describe the demographic and economic modules of the model.

The Demographic Module

Population is, as in past DBEDT projections, estimated as the sum of natural population change and net migration. Natural population change is derived by the cohort component

² Table 2a. Projected Population of the United States by Age and Sex: 2000 to 2050, <http://www.census.gov/ipc/www/usinterimproj/natprojtab02a.xls>, March 18, 2004.

³ Projections of the Total Population of States: 1995 to 2025, <http://www.census.gov/population/projections/state/stpipop.txt>, Population Paper Listing #47, 1996.

method and net migration is linked to the employment requirements estimated using the economic module.

Natural Population Change

The foundation data sets for population projection are the single-year age by sex tables for each county in the state from the 2000 Population Census.⁴ These tables provide the age-sex distribution of total resident population for each county as of April 1, 2000. To make these tables suitable to perform a cohort component process comparable to DBEDT's previous long-range forecasts, two modifications were made: active-duty military and military dependents were removed⁵ and the April 1, 2000 county distributions were adjusted to reflect the July 1, 2000 population estimates from the U.S. Census Bureau. These modifications produced the 2000 baseline estimate of other civilian population.

Estimates on fertility and survival rates were developed from birth and death data collected by the Office of Health Status Monitoring (OHSM) of the Hawaii Department of Health (DOH). Births and deaths recorded by the OHSM for 1999 through 2001 were sorted by county, age, and sex. To the degree possible, the data were also sorted for military status - for the individuals in the case of deaths and for the parents in the case of births. Other civilian birth and death estimates by county, age, and sex for 2000 were approximated by averaging the 1999 through 2001 data.

Fertility

The age- and sex-specific fertility rates for each county were estimated for 2000 by dividing the number of other civilian births (excluding non-military and military dependent births) in each category by the number of other civilian women in each age category. Non-zero rates occurred for mothers from 12 years old to 53 years old. Other Civilian total fertility rates -- the total number of children born per woman of child-bearing age -- in 2000 were estimated to be 1.833 on Honolulu, 2.21 for Hawaii and Maui Counties, 2.26 on Kauai.

Fertility rates for the years 2001 through 2030 were based on the 2000 rates, but were adjusted slightly upward to approximate the increase in fertility assumed by the U.S. Census Bureau in its 1995 to 2025 state population projections. Census Bureau projections were used in the absence of Hawaii-specific projections of changes in fertility. The Census Bureau used the fertility assumptions from the middle series national projections, which produced "a slight increase in the levels of fertility from a total fertility rate of 2.055 children per woman in 1995 to

⁴ U.S. Census Bureau, Census 2000 Summary File 1 Hawaii (July 25, 2001), http://factfinder.census.gov/servlet/DTTable?_bm=y&-context=dt&-ds_name=DEC_2000_SF1_U&-mt_name=DEC_2000_SF1_U_PCT012&-CONTEXT=dt&-tree_id=4001&-all_geo_types=N&-geo_id=05000US15001&-geo_id=05000US15003&-geo_id=05000US15005&-geo_id=05000US15007&-geo_id=05000US15009&-format=&-lang=en

⁵ U.S. Census Bureau, Special Tabulation 46, June 2003.

an ultimate level of 2.163 in the year 2025.⁶ The adjustment caused the Hawaii state average total fertility rate to go from 1.939 in 2000 to 2.057 in 2030. The age pattern of fertility was not altered from the year 2000 pattern in the adjustment.

Fertility data and rates for the counties are reported in Appendix Tables A-67 through A-70.

Mortality

The survival rates for Hawaii's other civilian population for the 2030 Series population projections were estimated using the same life table methodology as the 2025 Series, which is almost identical to the methodology used by the U.S. Department of Health and Human Services Centers for Disease Control and Prevention.⁷ The proportions of those dying by age, sex, military status, and county for the year 2000 were generated by dividing the average deaths for 1999 through 2001 by the other civilian population in each category. Next, the number of persons living at the beginning of each age interval was calculated. This statistic was standardized by beginning from a group total of 100,000 in the less-than-one age group. Then the number of expected deaths in each age group was subtracted from the number living at the beginning of that age interval to produce the number living at the beginning of the next interval. In order to approximate mid-year (July 1st) conditions, the stationary population in the interval is calculated by subtracting half the number dying in each age interval from the number living at the beginning of the interval. Survival rates for 2000 are then estimated by dividing the stationary population in each interval by the population in the previous interval. Projection of mortality is performed by applying the survival rates to the number of persons living in each category for each year of projection.

Mortality rates change over time. Both for Hawaii and the U.S., improved health services, increased affluence, and other factors have generally decreased mortality, increasing the number of annual survivors in each age group. Past DBEDT population projections have reflected this improvement by increasing survival rates for succeeding years of projection. Mortality rates for years after 2000 for the Series 2030 projection have been decreased to produce changes in life expectancy similar to those used by the Census Bureau for national population projections.

Life expectancy is the standard summary statistic for mortality in a population. Life expectancy at birth is estimated by summing the stationary population estimates for all age groups and dividing by the initial standard population. Hawaii life expectancy at birth has typically been above the national rates for both sexes.

⁶ Campbell, Paul R. "Population Projections for States by Age, Sex, Race, and Hispanic Origin: 1995 to 2025," U.S. Census Bureau, PPL 47, October 1996, page 27.
<http://www.census.gov/population/www/projections/ppl47.html>

⁷ "Method for Constructing Complete Annual U.S. Life Tables," CDC, Series 2, No. 129, December 1999, pages 4-8.

Table 2-1. Life Expectancy Values for Hawaii and the U.S.

U.S.	1990	2000	2025
Males	71.8	74.1	77
Females	78.8	79.5	81.2
Hawaii			
Males	75.5	76.8	79.3
Females	81.7	82.5	83.5

Source: U.S. data come from Table 28 of “Health, United States, 2002,” National Center for Health Statistics of the Centers for Disease Control, page 116. The 2025 male and female values approximate a combined 79.1 year life expectancy. Hawaii estimates are derived from the 2025 Series and 2030 Series data.

No projections exist for mortality change in Hawaii, but the Census Bureau has projected the expected change in mortality for the nation as a whole. For projecting U.S. state populations the Census Bureau assumed that life expectancy would increase from 75.9 years in 1995 to 79.1 years in 2025. These assumptions about future levels of mortality are “consistent with the middle series mortality assumptions used in the national population projections.”⁸ Hawaii life expectancy in 2030 was assumed to be 79.3 years for males and 83.5 years for females, based on the U.S. projection and the relationship between Hawaii and U.S. life expectancy shown in Table 2.1 above.

Age- and sex-specific death rates for the forecast years from 2001 to 2030 were estimated by extrapolating from U.S. survivorship data.⁹ U.S. survivorship data for 1989-1991 was compared with 2000 data and the differences in each age group were calculated for both sexes. It was observed that mortality rates were decreasing with age for both sexes. The pattern of change observed for the decade was extrapolated over the three decade forecast period to produce mortality rates that decrease at a slower rate than the rates observed in the 1990s. The survivorship age-group series for 2030 for males and females were then adjusted proportionally to produce series that meet the life expectancy assumptions. Survivorship series for the intervening years were then produced as linear interpolations of the difference in each age group between the 2000 and 2030 values. These survivorship series were then converted to survival rates and used to project deaths for each year. The survival rates for each county and the adjustments to survival during the projection period are shown in Appendix Tables A-71 through A-82.

⁸ Campbell, Op. Cit., page 28.

⁹ Arias, Elizabeth, “United States Life Tables, 2000,” Centers for Disease Control and Prevention, National Vital Statistics Reports, Vol. 51, No. 3, Table 10.

Net Migration

Net migration was assumed to be dependent mainly on labor demand as projected in the economic module. Employment by county was projected based on the outputs generated in the economic module beginning from final demand assumptions for each county. For each year of projection, the county employment estimates from the economic module were compared with the expected employment in the population module based on average observed labor force participation rates. County net migration was then adjusted up or down until the population included an 18 to 64 year old component that was compatible with the projected employment demand.

In this report, labor force participation rate means the ratio of employed persons to the resident population in the 18 to 64 age group. In 2000, these ratios by county were 73.8 percent for Honolulu, 72.2 percent for Hawaii County, 84.1 percent for Maui, and 77.8 percent for Kauai. Resident population was used rather than other civilian population, since military dependents are often in the Hawaii work force and active-duty military are sometimes in the Hawaii labor force. Since the numbers of military and military dependents are held constant through the projection, the variable component of the 18 to 64 age group will be made up of the other civilian population, implying that the same number of military and military dependents are employed in each time period.

Labor force participation was allowed to grow slightly on a statewide basis during the projection period reflecting the long-term national trend. The national trend of increasing labor force participation is largely a function of an increasing share of women in the labor force. Labor force participation for Honolulu and Kauai Counties were caused to converge toward the Maui rate based on the national trend. Labor force participation for Hawaii County was maintained near its existing rate to reflect the assumption of a weaker relationship between population growth and employment.

The age pattern of migration was estimated by attempting to remove the natural population changes from the total population changes in Hawaii using age by sex data for 1990 to 1999 and calculating the age-specific differences between the sequential years. These differences were assumed to show net migration by age-group. The annual differences were irregular, so they were averaged over all years and both sexes and then smoothed. The resulting distribution is positive from infancy through high school, negative during the undergraduate years, strongly positive from 22 to 34, then tapering off gradually with some net out-migration in the late sixties. The estimated age pattern of net migration is shown in Appendix Table A-83 and the historical net migration series is shown in Appendix Table A-84.

The Economic Module

The economic module produced the projections of various economic components of the 2030 Projections Series, including output, employment, personal income, and gross county product (CGP) for each of the four counties. The summation of county projections produced the projections for the state. The development of economic module can be summarized in terms of three phases.

During the first phase, an inter-county input-output (I-O) model was constructed from the 1997 state I-O model. The inter-county I-O model is intended to provide a more appropriate framework in producing the county-level projections compared to the state I-O model and the county allocation procedure used in the past long-range projections.

The second phase involved the projection of all final demand components for each year through 2030. Each component of final demand by industry was independently projected for each county and each industry starting from its 1997 value in the inter-county I-O model.

The third and final phase was to generate the projections of various economic variables (i.e., output, jobs, employment, income, etc.). This was accomplished by applying the 1997 inter-county I-O model to the projected series of final demands.

The I-O relationships that formed the foundation of the 2030 Projection Series were estimated using 1997 output data from the Economic Census. To provide a more recent starting point for the projections, the model was benchmarked to 2000 using employment and income data by sector. The model was calibrated by attempting to reproduce actual wage and salary jobs counts for 2001, 2002, and 2003.

The Inter-County I-O Model

The 1997 inter-county I-O model is a 20 sector by 4 county model of the inter-regional type, meaning that the flows of goods and services among the counties are accounted for in the model. The inter-county I-O model, developed to be consistent with the condensed form of the 1997 Hawaii State I-O model, was further aggregated to 12 sectors by 4 county model for use in the 2030 long-range projection. Table 2-2 shows the sectors included in the original inter-county I-O model and those used in the 2030 projections. This aggregation produces a 48 by 48 inter-industry matrix and, when each county's labor income and personal consumption expenditure are made endogenous, it becomes a 64 by 64 Type-II total requirements matrix.¹⁰

¹⁰ For more detailed description of the inter-county I-O model, see the 1997 Hawaii Inter-County Study by DBEDT.

Table 2-2. Inter-county I-O and 2030 Projection Sectors

Inter-county I-O model		2030 projection series	
Sector #	Sector name	Sector #	Sector name
1	Agriculture	1	Agriculture
2	Mining and construction	2	Mining and construction
3	Food processing	3	Manufacturing
4	Other manufacturing	3	Manufacturing
5	Transportation	4	Transportation and utilities
6	Information	5	Information
7	Utilities	4	Transportation and utilities
8	Wholesale trade	6	Trade
9	Retail trade	6	Trade
10	Finance and insurance	7	Finance, insurance and real estate
11	Real estate and rentals	7	Finance, insurance and real estate
12	Professional services	8	Business and professional services
13	Business services	8	Business and professional services
14	Educational services	11	Other services
15	Health services	9	Health services
16	Arts and entertainment	11	Other services
17	Hotels	10	Accommodation and food services
18	Eating and drinking	10	Accommodation and food services
19	Other services	11	Other services
20	Government	12	Government

Projection of Final Demands

Because of the lack of historical data, especially the data on industry final demands for counties, the use of econometric analysis was not feasible in projecting final demands. Therefore, other characteristics of various final demand components, such as their previous nominal and real growth rates and their relationships to other economic variables at the state and national levels, including population, GDP (gross domestic product), GSP (gross state product), and income were observed. This information and the 1997 inter-county I-O model (Appendix Table A-24) provided a basis for projection. Below is a description of procedures involved in projecting each of the various final demand components.

Personal Consumption Expenditures (PCEs)

PCEs were projected in nominal terms by county and by industry, using per capita PCEs in the 1997 inter-county I-O model, initial estimates of population projections for each county, projected rates of changes in consumer price indices (CPI) by industry, and some assumed rates

in annual real growth in per capita personal consumption. Initial population projections were based on projected natural increases and historical levels of net migration, as well as population growth projected in DBEDT's 2020 and 2025 Projection Series. Consumer price changes by sector were approximated based on historical data on consumer price indexes for Honolulu. Real growth in consumption was based on projected data on personal consumption expenditures for the US from the Bureau of Labor Statistics, UCLA Anderson Forecasts, and the Blue Chip Financial Forecasts.

Appendix Table A-39 shows the annual changes in projected CPI by sector and Appendix Table A-40 shows annual changes in real per-capita personal consumption expenditures assumed in projecting PCEs by sector and by county. Projected total PCEs by county are presented in Appendix Tables A-41 through A-45.

Visitor Expenditures

Projections of total visitor expenditures (including both locally produced and imported goods and services) through 2030 were provided by the Tourism Research Branch in five-year intervals, starting from 2000. Imports were removed from the projected total visitor expenditures based on import shares in total visitor expenditures in the 1997 inter-county I-O model. The resulting estimate of total visitor expenditures on locally produced goods and services was then allocated to individual industries using their shares in total visitor expenditures in the 1997 I-O table, with some downward adjustments to the shares of agriculture and manufacturing sectors in an attempt to account for historical increases in the import components of these sectors.

Forecasts of visitor expenditures and related variables are presented in Appendix Table A-38 and Appendix Tables A-41 through A-45, and historical visitor data are shown in Appendix Tables A-32 to A-37.

Gross Private Investment (GPI)

GPI was projected in three parts: new residential construction, new hotel construction and the rest, which included commercial construction, repairs and maintenance, and addition/alteration. The value of new residential construction was estimated based on the projected demands for new housing units due to population growth. The number of new housing units was estimated based on initial county population projections, family size, and estimated construction cost per unit by county for 2002, obtained from the US Census Bureau. Family size was based on the 2000 Population Census, with some downward adjustment for future years based on the rate of decline in family size observed between the 1990 and 2000 Population Censuses. The value of new hotel construction was estimated based on the number of new hotel units projected by Tourism Research Branch. The value of rest of the construction components was assumed to remain at about the 2000-2001 level in real dollars.

Projected values of construction and other investment component of GPI by county are presented in Appendix Tables A-41 through A-45.

State and Local Government Consumption

The projection of state and local government consumption expenditures was done in two steps. First, the state and local government payments to households (compensation to state and local government employees) was projected for each county, based on past trends on per capita growth in compensation of state and local government employees and initial population projections by county. The projected compensation of state and local government employees was then converted to total general consumption expenditures for the state and local government sector based on the ratio of state and local government employee compensation to general state and local government consumption in the 1997 inter-county I-O table. Second, expenditures on state and local government procurement of goods and services from industries were projected based on projected state and local government general expenditures and ratios of state and local government expenditures on goods and services purchased from the industries to general state and local government expenditures in the 1997 inter-county I-O table.

Projected values of state and local government consumption by county are presented in Appendix Tables A-41 through A-45.

State and Local Government Investment

The projection of state and local government investment was done in terms of two components: construction and spending on durable equipment. The construction portion of state and local government investment was projected based on the assumption that per capita state and local government construction would remain constant at the 2000 level in real terms through the forecast period. The state and local government investment on durable equipment was estimated based on the ratios of state and local government spending on durable equipment to state and local government consumption expenditures on goods and services from industries in the 1997 inter-county I-O table and projected levels of state and local government consumption expenditures, as described above.

Projected values of state and local government investment by county are presented in Appendix Tables A-41 through A-45.

Federal Government Consumption

The projection of federal government consumption expenditures was done in the same manner as state and local government consumption expenditures. First, the general federal government (military plus civilian) expenditures was projected based on the past trends of per-capita growth in compensation of federal employees and initial population projections. The projected general federal consumption expenditures was combined with the ratio of expenditures

on federal procurement on goods and services to the general federal consumption expenditures in the 1997 inter-county I-O model to produce the projections of federal expenditures on industries' goods and services.

Projected values of federal government consumption by county are presented in Appendix Tables A-41 through A-45.

Federal Government Investment

Like state and local government investment, federal government investment also included two components: construction and spending on durable equipment. Federal construction was kept more or less constant in real terms at the 2000 level, except for some upward adjustments on Honolulu and Hawaii counties to reflect inflows of new defense and military housing related construction funds for the coming years.

Projected values of federal government investment by county are presented in Appendix Tables A-41 through A-45.

Exports

Exports were projected based on the export values in the 1997 inter-county I-O table and annual growth rates approximated from the projections of U.S. Exports from the UCLA Anderson Forecasts. Projected values of exports by county are presented in Appendix Tables A-41 through A-45.

Projections of Economic Indicators

Output

Annual output for each industry in each county was projected using projected total final demands and the 1997 inter-county I-O model. This was done by post-multiplying the inter-county total requirements matrix by total annual projected final demand vector for each year through 2030. The summation of all final demand components described in the last section produced total final demands. These projected outputs, in turn, formed the basis for projecting job counts by industry. Projected outputs by county and by industry are presented in Appendix Tables A-46 through A-50.

Jobs

Jobs were estimated by multiplying projected outputs by jobs-to-output ratios from the 1997 inter-county I-O tables, adjusted for inflation and labor productivity change. Because of the lack of consistent historical data on outputs by industry, estimates of labor productivity

growth were developed by comparing the ratios of labor income to number of jobs by industry and by county using the Bureau of Economic Analysis (BEA) personal income and employment data for 1970, 1980, 1990, and 2000. The rates of changes in income-to-job ratios in the past (in most cases changes between 1990 and 2000), shown in Appendix Tables A-90 through A-94, were used as the basis for projecting the rates of labor productivity changes for each industry in each county through 2030. The historical productivity estimates were adjusted so that, given the projected outputs, the model could reproduce actual job numbers observed in 2001, 2002 and 2003.

Job projections involved three types of jobs, namely total wage and salary jobs consistent with BEA wage and salary job series, civilian wage and salary jobs consistent the Hawaii Department of Labor and Industrial Relations (DLIR) wage and salary job count series, and self-employed or proprietors' jobs consistent with BEA proprietors' jobs series. The DLIR-type wage and salary job projections formed the basis for projecting employment (i.e., the number of people employed).

Projected civilian wage and salary jobs by industry and by county are presented in Appendix Tables A-52 to A-56. Projected self-employed (proprietors'), also by industry and county, are presented in Appendix Tables A-57 through A-61. Appendix Tables A-85 through A-89 show total jobs (wage and salary plus self-employed jobs) to output (in million of 2000 dollars) ratios by county and by industry.

Employment

The total projected civilian wage and salary job counts were used to project civilian employment using an econometric relationship between job count and employment for each county estimated based on the historical job count and employment data.¹¹ Projected employment estimates were then compared with projected population in the 18 to 64 age group for each county to estimate net migration, as described above in the population module description. Projected employment and labor force data are presented in Appendix Table A-51.

Personal Income

Personal income was projected in terms of three components: Labor income, transfer income, and dividends, interest and rent. First, each of these components was projected separately for each county as described below, and then their summation produced the projections of personal income.

Projected series of total personal income and its components by county are presented in Appendix Tables A-25 and A-26.

¹¹ Note that employment can be different from wage and salary counts for two opposing factors. Employment can be higher than wage and salary counts as it also includes self-employment and it can be lower due to people having multiple jobs. The historical data show that employment estimates are higher than wage and salary estimates for Hawaii and Maui counties and lower on Oahu. They are similar for Kauai County.

Labor Income

Labor income consisted of two components: wage and salary and proprietors' income. Wage and salary income was projected using the BEA-type wage and salary jobs projections and proprietors' income was based on self-employed or proprietors' jobs. Two approaches were tried out in each case. First, an econometric relationship was used between total wage and salary (proprietors') jobs and wage and salary (proprietors') income. Second, each component was projected by applying the wage rate by sector in the 1997 inter-county I-O model to job and labor productivity projections by sector. The summation across sectors produced total wage and salary and proprietors' income for each county. The second method yielded more plausible results and hence was used in labor income projections.

Transfer Income

Two methods were considered in projecting transfer income too. The first method was using an econometric relationship explaining current transfer income in terms of one period-lagged transfer income, population aged 65 and older, and the number of unemployed people in each county. The second method was based on the ratio of transfer income to population aged 65 and older in 2001, annual growth rate of this ratio between 1990 and 2001, and projected population in that age group. The second method was selected as this produced more reasonable projections.

Dividends, Interest and Rent

Two approaches were tried for each county; one involving an econometric relationship between total dividends, interest and rent and total population and the other involving total dividends, interest and rent in 2001 and its annual growth rate between 1990 and 2001. The results obtained from the second method were used in projections.

Gross County Product (GCP)

GCP was projected from the expenditure side of I-O conventions, in which total final demands less total intermediate imports by industries gives the total value of final goods and services produced within an economy, which is called gross state product (GSP) at the state level and equivalently gross county product (GCP) at the county level. Thus, the projection of GCP involved the projection of intermediate imports by county. This was done by applying intermediate imports to output ratios by industry in the 1997 inter-county I-O model to projected outputs by industry. GCP was calculated by subtracting total projected intermediate imports from total projected final demands for each county. Totaling GCP across counties produced GSP figures. Projected estimates of GSP and GCP are presented in Appendix Table A-23.

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Appendix Tables

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